An evaluation report on greenhouse gas pollution prevention projects in Indian Sugar Industry

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Background

The United States Agency for International Development (USAID) is implementing a Greenhouse Gas Pollution Prevention (GEP) project to assist India's power sector development and to reduce greenhouse gas emissions. The Alternative Bagasse Cogeneration (ABC) component of the Project envisages the utilization of Biomass fuels for efficient cogeneration in Indian sugar mills. The primary objective of the ABC component is to reduce the CO_2 emissions per unit of electricity generated from bagasse and to encourage the use of alternative Biomass fuels during the off-season in high efficiency cogeneration plants. USAID have identified nine Indian sugar mills in two phases and provided with financial assistance in the form of grants for implementing such projects. Winrock International India who are implementing the technical assistance activities under the GEP Project has engaged the services of Industrial and Technical Consultancy Organisation of Tamil Nadu Ltd. (ITCOT), Chennai, to assist them in monitoring these sugar mills.

Methodology

The monitoring of the GEP mills is based on the Sugar Factory Energy Data Protocol developed by the International Cane Energy Network and managed by Winrock International. Formats for the collection of plant performance data were based on this protocol. The nine GEP projects were grouped into three categories for easier comparison of performance as in Table 1

Table 1. Categories of sugar mills for performance monitoring

Category 1	Sugar mills which have commissioned GEP cogeneration projects when the monitoring study was initiated and hence, baseline data is with cogeneration
Category 2	Existing sugar mills where high pressure cogeneration facilities is under implementation
Category 3	New sugar mills with high pressure cogeneration facilities

Technical Requirements

The GEP-ABC component is extending the merits of bagasse cogeneration to the use of Biomass fuels year round, as many co-generation developers use coal or lignite in the off-season. The ABC component is providing Financial Assistance (FA) grants to support demonstration of state-of-the-art cogeneration technologies. Sugar mills were selected that met the criteria established for the GEP-ABC component. The major technical requirements are given in Table 2

Table 2. Technical requirements

Use of Bagasse/ Biomass	Not less than 270 days in a year (Using Biomass fuels in the off-season)
Conversion Technology	Steam cycles that maximize electrical energy output
Minimum Boiler Pressure	> 60 kg /cm^2 and 480°C

Financial Assistance – Criteria

The FA grantee is required to make necessary arrangements for bringing in the funds agreed to for financing the project. Disbursement of Grant is made on the basis of matching promoter's contribution on a percentage basis. The 1ast installment of 10% of the Grant is disbursed after satisfactory completion of plant operation for a minimum of 270 days in a year using bagasse/ Biomass fuels and certified by an authorised USAID/ IDBI agency. Capability to use Biomass for 270 days in a 12-month period is to be demonstrated within two crushing seasons after commissioning of the project.

Performance Indices

The International Cane Energy Network (ICEN) has prepared a Sugar factory Energy Data Protocol to guide sugar factories on monitoring the process energy consumption. By collecting averaged and instantaneous data, universally comparable indices can be computed which reflect the energy usage efficiency in the sugar mill. The protocol identifies a set of 18 Performance indices given in Table 3 to be monitored which determine the efficiency of energy usage in the factory over different periods of time.

Table 3.Performance Indices

Index	Units
Fibre % Cane	%
Imbibition: Cane	%
Moisture % Bagasse	%
Ash % Bagasse	%
Mechanical Drives Steam: Cane	Kg/of cane crushed
Boiling House Steam: Cane	Kg/ of cane crushed
Boiling House Vapor: Boiling House Steam	%
Dilution water added to mixed juice	%
Brix % Syrup	%
Boiler Efficiency	%
Steam: Bagasse	Kcal / kWh
Heat Rate, Processing	Kcal / kWh
Heat Rate, Generation – only	Kcal / kWh
Power Generation: Cane	kWh /cane
Net Power Generation: Cane Fibre	kWh / cane fiber
Supplementary Fuel consumption	% on kcal basis
Factory/ Power plant load: Cane	kWh: cane
Operating-time efficiency	%

Conclusion

Monitoring USAID's GEP Project on Alternative Bagasse Cogeneration indicated that five mills have achieved the 270 day running of the cogeneration plant with in the stipulated project period and one unit has failed to comply the criteria where as three units are in the process of implementation.